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Fieber et al.

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[54] **PUSHBUTTON SWITCH OR PUSHBUTTON-ACTUATED SLIDE SWITCH**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[3] **H01H 9/26;** H01H 9/20

[52] **U.S. Cl.** ..... **200/153 J;** 200/328; 200/5 EA; 200/325

[58] **Field of Search** ..... 200/5 E, 5 EA, 5 ED, 200/153 J, 328, 323, 324, 325

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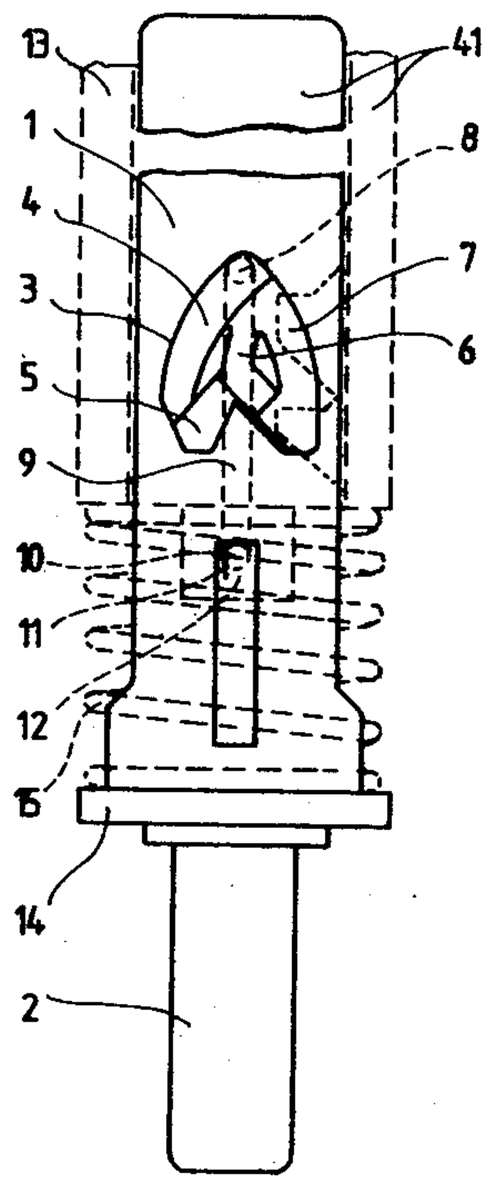
[57] **ABSTRACT**

In a pushbutton switch or pushbutton-actuated slide switch having a detent mechanism designed to have the shape of a heart cam, an individual latching and a mutual unlatching is made possible in that, according to the invention, the heart cam is provided with a further, center curved path for the unlatching (disengaging) purpose. Within this area of the position of the detent pin, the latching is accomplished by a cross slide which, during the off-switching process, can be pressed via a limit stop and by the detent pin into the unlatching (disengaging) position.

1 Claim, 9 Drawing Figures



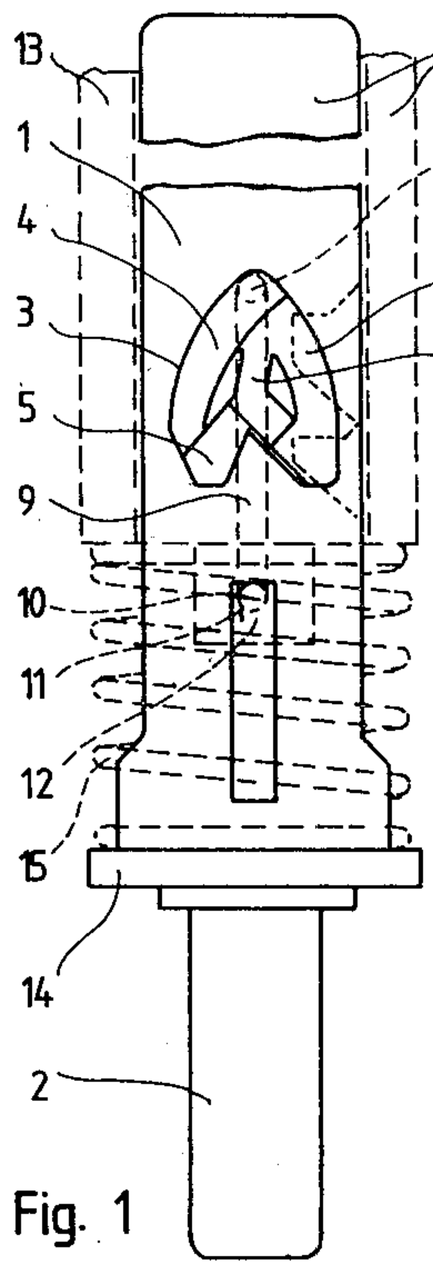


Fig. 1

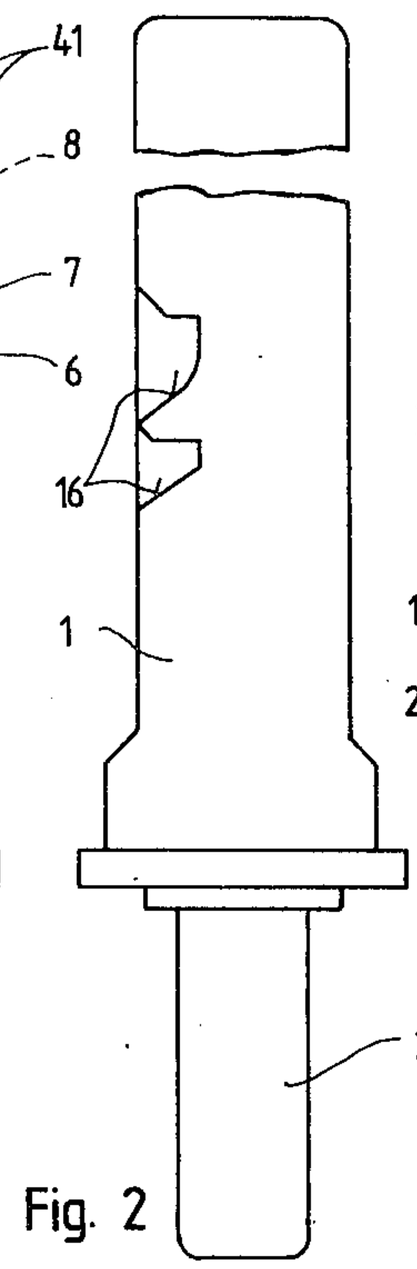


Fig. 2

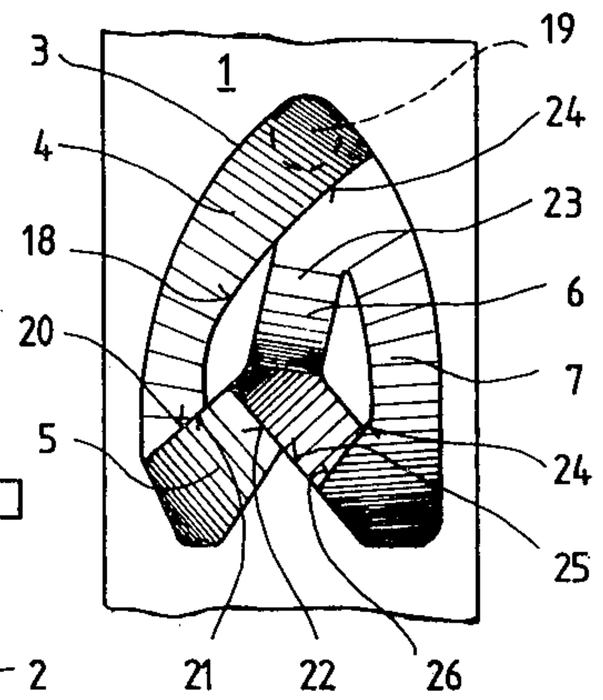


Fig. 3

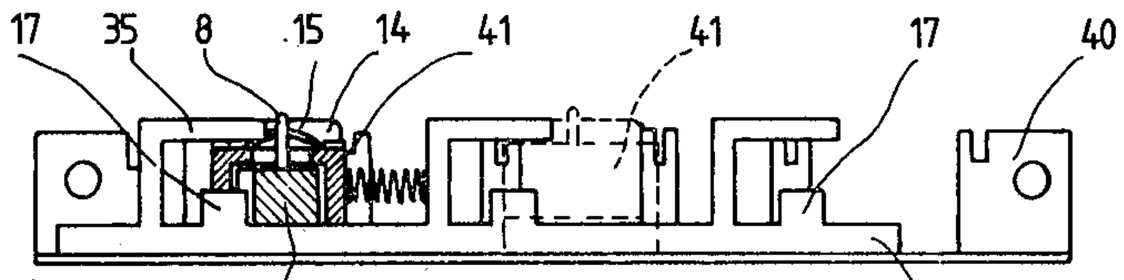


Fig. 4

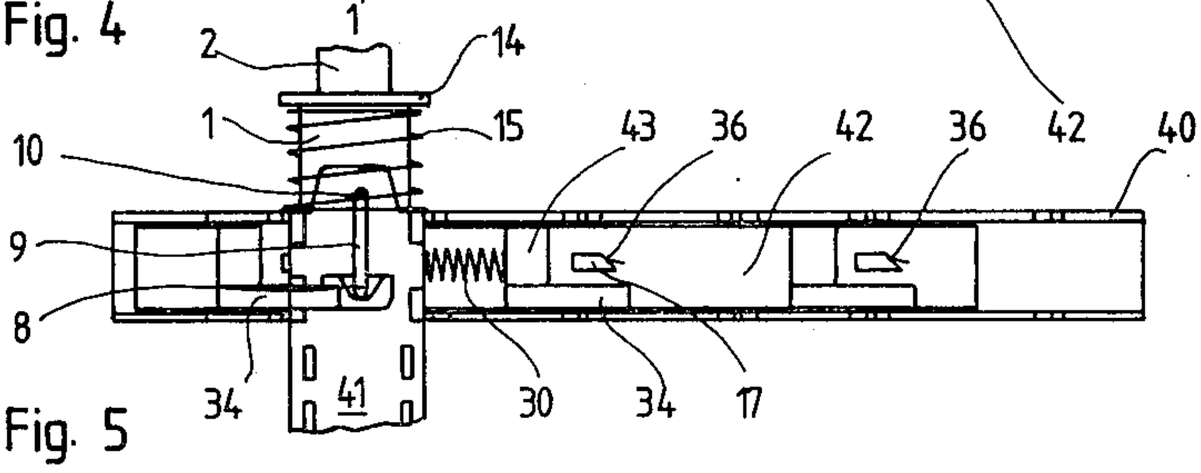


Fig. 5

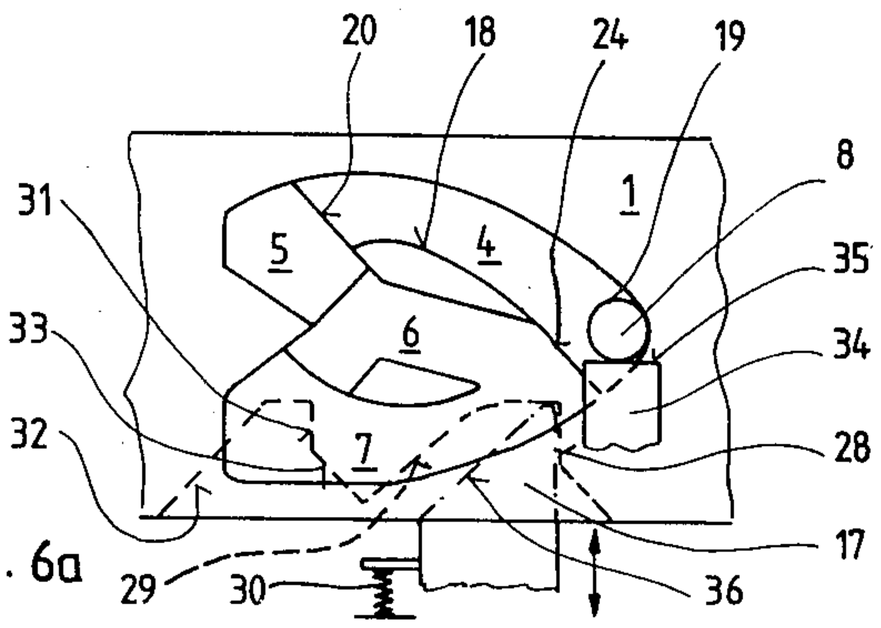


Fig. 6a

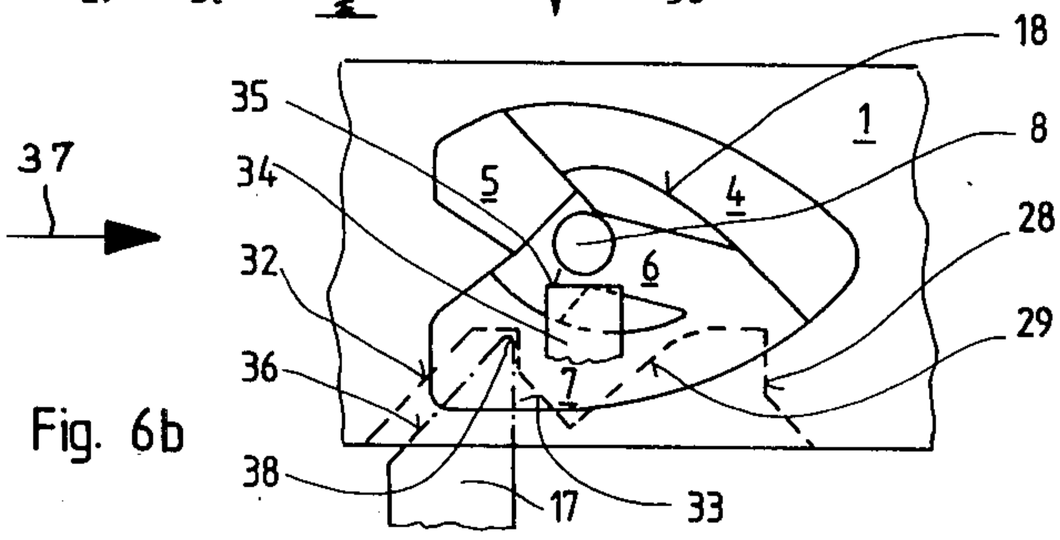


Fig. 6b

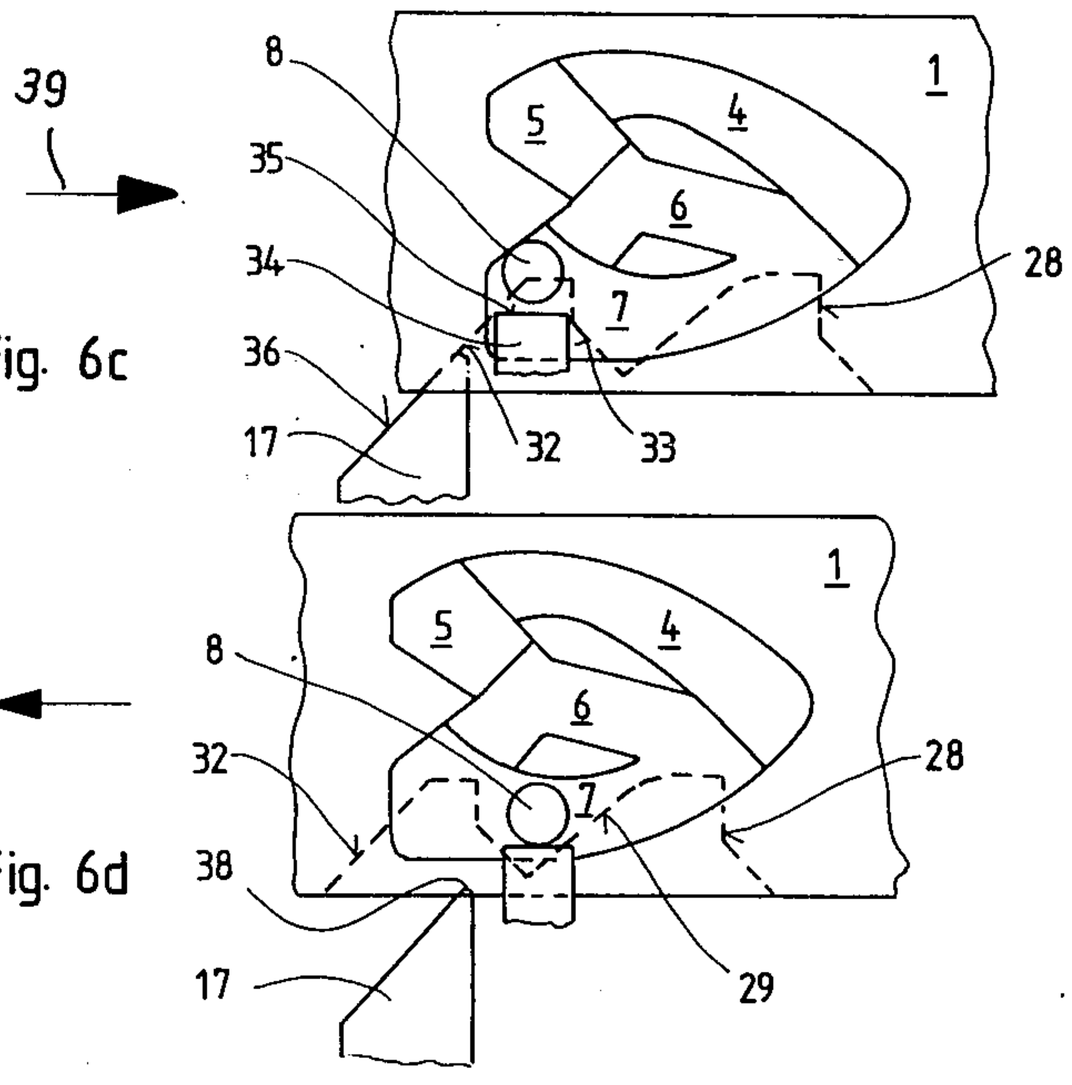


Fig. 6c

Fig. 6d

PUSHBUTTON SWITCH OR PUSHBUTTON-ACTUATED SLIDE SWITCH

BACKGROUND OF THE INVENTION

The present invention relates to a pushbutton switch or pushbutton-actuated slide switch which is capable of being engaged and disengaged by means of a heart cam comprising an engaging and disengaging curved path, and an engaging pin which is capable of being laterally deflected and longitudinally displaced in relation thereto, and is capable of being combined with further switches, in particular of the same type, to form a pushbutton assembly.

Switches comprising these conventional heart cams serving as detent means, are designed as individual pushbuttons with individual release for the on-off switching and may be combined to form pushbutton assemblies.

Pushbutton switches or pushbutton-actuated slide switch assemblies are also known, in which the individual pushbutton switches, if so required, are capable of being engaged and disengaged either individually or in common with the aid of a common disengaging rail or engaging flap. In this way several pushbutton keys can be depressed simultaneously or one at a time in turn, and quite depending on the detent mechanism, either several or all pushbuttons can be released simultaneously either by a special key or by one of the other keys.

It is the object of the present invention, amongst others, to design switches with heart cams as detent means, in such a way that these switches can be used as pushbuttons with an individual engagement, and can also be designed in such a way that several can be switched simultaneously, in particular of being disengaged simultaneously.

SUMMARY OF THE INVENTION

This object is achieved in that the heart cam is provided with a second, central disengaging curved path extending from the detent or engaging position to the zero position. Owing to this embodiment of the heart cam, the pushbutton switch or pushbutton-actuated slide switch can be used at first as a "non-locking type" pushbutton switch, because by the additional disengaging curve is not yet enabled an engagement. According to an advantageous further embodiment of the invention, the switch is provided with a detent member, e.g., in the form of a detent rail, which is capable of being actuated by a detent profile capable of being displaced as well during the pushbutton actuation, and is capable of retaining the switching slide in the detent position. On account of this additional measure, the switch according to the invention can be used as a single-release switch or else, when the detent member is capable of being actuated by other means, such as by other switches, for effecting a group release. By the entirety of these measures, therefore, the novel switch can be used very universally either as a non-locking pushbutton switch or as a switch suitable for individual or group release without any alterations having to be carried out on the switch itself.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantageous details of the invention will now be described hereinafter with reference to an example of embodiment shown in FIGS. **1** to **6** of the accompanying drawings, in which:

FIG. **1**, in a top view, shows a switch slide designed in accordance with the invention, in a simplified representation, without contacts, with the housing thereof merely being denoted by the dashlines,

FIG. **2** shows the bottom side of the switch slide according to FIG. **1**,

FIG. **3** shows the heart cam on an enlarged scale,

FIG. **4** is the sectional side view of a switch inserted into a frame of a pushbutton assembly,

FIG. **5** shows the arrangement of FIG. **4** in a top view, and

FIGS. **6***a* to **6***d* show the various operating positions of the heart cam together with an associated detent rail.

DETAILED DESCRIPTION

In FIG. **1**, the reference numeral **1** indicates a switch slide of a pushbutton switch or pushbutton-actuated slide switch, onto the finger **2** of which a not shown pushbutton keytop is capable of being placed. The surface of the switch slide **1** is provided with a heart cam **3**, in the curved paths **4**, **5**, **6** and **7** of which a detent pin **8** is guided. The latter consists of a wire member **9** whose one end is the detent pin **8** and whose other end serves as the hold pin **10**. In the example of embodiment, this hold pin **10** is pivotally mounted in an opening **11** of an extension **12** of the housing **13**. Between the housing **13** and a stop plate **14** of the switch slide **1** there is clamped a return spring **15**. With some of its turns, this return spring **15** presses simultaneously upon the wire member **9**, so that the detent pin **8** is resiliently applied to the bottom of the curved paths of the heart cam.

The bottom side of the switch slide **1** as shown in FIG. **2**, is provided on its side with a detent profile **16** which cooperates with a detent member designed to have the shape of a detent rail or bar **17**, as is particularly shown in FIGS. **4** through **6**.

According to the invention, the heart cam **3** is provided with an additional central disengaging curved path **6**. This will now be explained in greater detail with reference to FIG. **3**. The crosslines in the curved paths **4**, **5**, **6** and **7** are indicative of the respective position thereof in a vertical sense. The nearer the crosslines are to one another, i.e., the darker the path appears, the lower is the bottom thereof. The curved path of the heart cam **3** consists of a first curved-path section **4** with a sliding edge **18** along which the detent pin **8**, upon depressing the switch slide **1**, can be slowly lifted from the zero position **19** thereof until it, via the final edge **20** of the curved path **4**, drops downwardly upon the engaging curved path **5**. Upon letting go the switch slide **1**, the detent pin **8** is moved along the sliding edge **21** of the engaging curved path **5**, is lifted thereby and slips over the final edge **22** of the engaging curved path **5** onto the central disengaging curved path **6** as arranged according to the invention. In the course of the further return movement of the switch slide **1**, the detent pin **8** slides along the slidings edge **23** of the disengaging curved path **6**, is lifted thereby and, via the upper final edge **24**, drops into the curved path **4** and, consequently back to the zero or initial position **19**.

When the switch slide **1**, after the detent pin **8** has jumped over the final edge **22**, is further moved in the sliding direction, it will slide along a second sliding edge **25** of the disengaging curved path **6**, and, via the lower final edge **26** of the curved path **6**, will drop onto

the outer disengaging path **7**. When the switch slide **1** is moved in the backward direction, the detent pin **8** slides along the sliding surface **27** of the outer disengaging curved path **7**, is lifted within this curved path and, via the upper final edge **24** which is common to the central disengaging curved path **6**, is brought onto the curved path **4** and into the zero position **19**.

In this form, the switch is capable of being used as a non-locking pushbutton switch, because there is not effected any locking of the detent pin **8**, and because the latter only passes through the curved paths **4**, **5** and **6**.

The possible individual and group release will now be described hereinafter with reference to FIGS. **6***a* through **6***d*.

FIG. **6***a* shows the switch slide **1** in the non-depressed position. The detent pin **8** is in its zero or initial position **19**. By way of its stop edge **28**, the detent slide **17** cooperates with the detent profile **16**. The detent slide **17** can be displaced vertically in relation to the sliding direction of the switch slide **1** by means of a first slanting run-up surface **29** in opposition to the action of a spring **30**, hence in the drawing, in the downward direction. The detent profile **16** still has a detent surface **31** lying within the range of action of the detent rail **17**, and a second slanting run-up surface **32**, as well as a disengaging surface **33**.

To the detent slide **17** there is rigidly coupled a stop **34** which may also form one structural unit therewith. The end of the stop is designed as a pressure surface **35**. In the zero position **19**, this surface comes to lie close to the detent pin **8**.

In order to avoid a high surface pressure at the slanting run-up surfaces **29** and **32**, the detent slide **17** can be preferably provided with an edge **36** extending parallel in relation thereto.

The mode of operation of this arrangement according to the invention is as follows:

When the switch slide **1** is actuated from the position as shown in FIG. **6***a* in the direction as indicated by the arrow **37** as shown in FIG. **6***b*, the detent pin **8** moves along the sliding edge **18** over the final edge **20** onto the engaging curved path **5**. At the same time, the slanting run-up surface **29** cooperates with the edge **36** of the detent slide **17** and displaces the latter in the downward direction. Subsequently thereto, it slides with its pointed end **38** along the disengaging edge **33**, slips onto the detent surface **31** and finally comes into an operative connection with the second slanting run-up surface **32**.

If now, under the action of the return spring **15**, the switch slide **1** is permitted to slide back, it hits the detent slide **17** with its pointed end **38** against the detent surface **31** and retains the switch slide **1** in the detent position. In the course of this, the detent pin **8** slips from the engaging curved path **5** via the final edge **22** onto the disengaging curved path **6**. At the same time, by the displacement of the detent slide **17**, the pressure surface **35** is always carried along in such a way that it will not affect the movement of the detent pin **8**.

If, in this position as shown in FIG. **6***b*, the detent slide **17**, by actuating another pushbutton switch or any other suitable means, is moved in the downward direction until it slips out of the detent effect of the detent surface **31** of the detent profile **16**, then the switch slide **1**, owing to the force of the return spring **15**, will slide back to normal, because the detent pin **8**, along the disengaging curved path **6** and via the final edge **24**, is capable of sliding into the initial (zero) position **19**, in the course of which the pointed end **38** of the detent slide **17** slides along the disengaging edge **33** and is pressed by the latter in the downward direction until it, if so required, and along the detent profile **16**, meets against the stop edge **28**. This is the mode of operation in the case of a foreign or group release.

If no external or foreign release is effected in the position as shown in FIG. **6***b*, the switch slide **1**, by being repeatedly depressed in the direction as indicated by the arrow **39** in FIG. **6***c*, can be actuated in the over-travel. In the course of this, the detent slide **17** and the pressure surface **35**, by cooperating with the slanting run-up surface **32**, are displaced in the downward direction. At the same time, the detent pin **8** slides along the sliding edge **25** over the upper final edge **26** of the central disengaging curved path **6**, onto the outer disengaging curved path **7**. This position is shown in FIG. **6***c*. When letting go the switch slide **1**, the latter is capable of sliding into its normal position owing to the resetting force of the return spring **14**. This is accomplished in that at first the detent slide **17** slides in the upward direction, i.e., until the stop **34** presses with its pressure surface **35** against the detent pin **8**, thus pushing the latter against the sliding surface **27**. Subsequently thereto, the detent pin **8** slides along the sliding surface **27** (FIG. **6***d*) to the zero position **19**, thus pressing the detent slide continuously in the downward direction. This slide **17**, therefore, is prevented from coming into an operative connection with the detent surface **31**, so that a locking thereof is no longer possible. In this way, the initial position as shown in FIG. **6***a* is reached again.

FIG. **4** shows the U-shaped frame **40** of a pushbutton assembly comprising an inserted switch **41** according to the invention, whose switch slide **1** is provided with the heart cam **3**. The detent slides **17** and the associated stops **34** for each individual switch **41** to be inserted, are mounted on a common rail **42** designed as a cross slide, or consists, together therewith, of one single component part which may be either e.g., an injection-molded part or a molded article. The compression spring **30** is clamped between a stop member **43** of either the rail **42** or the stop **34** and the housing **13** of a switch **41**. The stops **34** are of hook-shaped design and extend from the rail **42** (cross slide) to the detent pin **8** on the top side of the switch **41**.

The rail (or cross slide) **42** is guided by an interspace provided for between the bottom side of the switch housing and the bottom **44** of the U-shaped frame **40**, as well as by the side walls of the U-shaped frame **40**. In such or a similar frame **40** there may also be provided switches **41** to which there is assigned a detent slide **44** which is not coupled to the rail **42**, or which is only supposed to perform the function of a pushbutton switch.

If so required, it is possible that also additional functions can be performed by the detent rail **17** or the rail **42** during the switching on and/or the over-travel, such as the actuation of an additional switch, for example, for an indicating lamp and/or for a mechanical indication, such as a drop indicator or diaphragm, etc.

What is claimed is:

1. An electrical pushbutton switch assembly comprising, in combination:

a housing;

a switch slider mounted in said housing for reciprocal motion therein, said slider having a generally heart-shaped cam in a first surface of said slider;

a detent pin extending through said housing and into said cam and said cam having a plurality of curved

paths for receiving and guiding said detent pin therein;

a return spring resiliently urging said slider in a direction away from said housing;

a detent profile provided in a surface of said slider adjacent to said first surface with said detent profile defining latched and released slider positions; and,

a detent bar movably mounted adjacent to said housing for reciprocal motion in a direction perpendicular to the direction of motion of said slider, said detent bar being resiliently biased toward said detent profile, said detent bar having a first projection extending into and engaging said detent profile, and said detent bar having a second projection extending toward and engaging said detent pin thereby to move said detent bar in response to relative movement of said detent pin with respect to said cam when the relative movement of said detent pin is along a selected one of said curved paths, whereby said detent pin moves said first projection away from said detent profile when the relative movement of said detent pin is along said selected curved path and toward the released slider position.

* * * * *